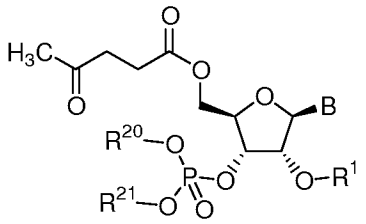
CLAIMS

[Claim 1] A ribonucleic acid compound represented by the following general formula (1):

[Chemical Formula 19]



(1)

(wherein B represents adenine, guanine, cytosine or uracil or a modified form thereof; R^1 represents a protecting group which can be removed at 90% or more at a temperature in the range from 0°C to 60°C under acidic conditions at a pH value from 2 to 4 within 24 hours; R^{20} represents H or an alkyl which may be substituted; and R^{21} represents an aryl which may be substituted or a monocyclic or bicyclic heterocyclic which may be substituted), or a salt thereof.

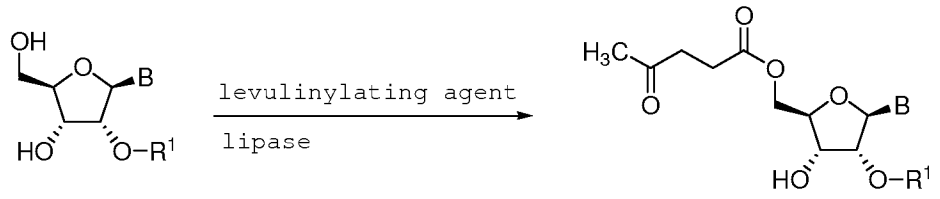
[Claim 2] The ribonucleic acid compound or a salt thereof according to claim 1, wherein R^1 is 2-tetrahydrofuranyl or 1,3-dioxolan-2-yl.

[Claim 3] The ribonucleic acid compound or a salt thereof according to claim 1 or 2, wherein R^{20} is H, 2-cyanoethyl or 2,2,2-trichloroethyl, and R^{21} is 2-chlorophenyl or 2-chloro-4-tert-butylphenyl.

[Claim 4] A method for producing a ribonucleic acid compound represented by the following general formula (3),

comprising regioselectively levulinylating the hydroxyl at the 5'-position by allowing a levulinylating agent and a lipase to act on a ribonucleic acid compound represented by the following general formula (2):

[Chemical Formula 20]

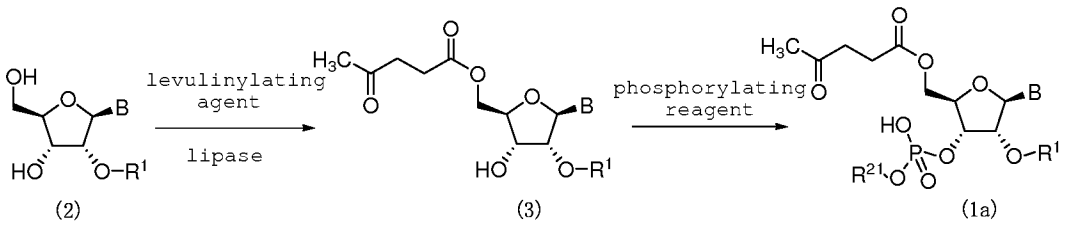


(2) (3)

(wherein B represents adenine, guanine, cytosine or uracil or a modified form thereof; and R^1 represents a protecting group which can be removed at 90% or more at a temperature in the range from 0°C to 60°C under acidic conditions at a pH value from 2 to 4 within 24 hours).

[Claim 5] A method for producing a ribonucleic acid compound (1) in which R^{20} is H represented by the following general formula (1a) by allowing a phosphorylating reagent to act on a ribonucleic acid compound represented by the following general formula (3) produced by a production method including the step of regioselectively levulinylating the hydroxyl at the 5'-position by allowing a levulinylating agent and a lipase to act on a ribonucleic acid compound represented by the following general formula (2):

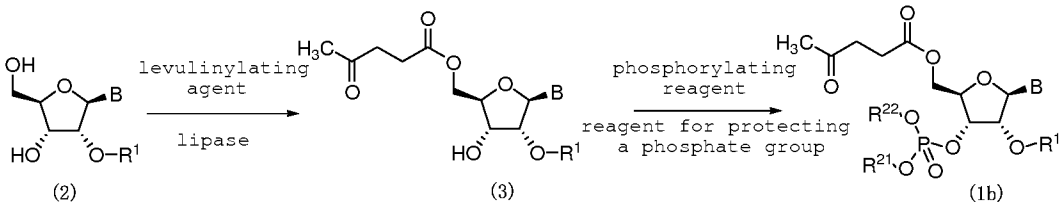
[Chemical Formula 21]



(wherein B represents adenine, guanine, cytosine or uracil or a modified form thereof; R^1 represents a protecting group which can be removed at 90% or more at a temperature in the range from 0°C to 60°C under acidic conditions at a pH value from 2 to 4 within 24 hours; and R^{21} represents an aryl which may be substituted or a monocyclic or bicyclic heterocyclic which may be substituted).

[Claim 6] A method for producing a ribonucleic acid compound (1) in which R^{20} is an alkyl which may be substituted represented by the following general formula (1b) by allowing a phosphorylating reagent and a reagent for protecting a phosphate group to act on a ribonucleic acid compound represented by the following general formula (3) produced by a production method including the step of regioselectively levulinylating the hydroxyl at the 5'-position by allowing a levulinylating agent and a lipase to act on a ribonucleic acid compound represented by the following general formula (2):

[Chemical Formula 22]



(wherein B represents adenine, guanine, cytosine or uracil or a modified form thereof; R^1 represents a protecting group which can be removed at 90% or more at a temperature in the range from 0°C to 60°C under acidic conditions at a pH value from 2 to 4 within 24 hours; R^{21} represents an aryl which may be substituted or a monocyclic or bicyclic heterocyclic which may be substituted; and R^{22} represents an alkyl which may be substituted).

[Claim 7] The method for producing a ribonucleic acid compound according to any one of claims 4 to 6, wherein R^1 is 2-tetrahydrofuranyl or 1,3-dioxolan-2-yl.

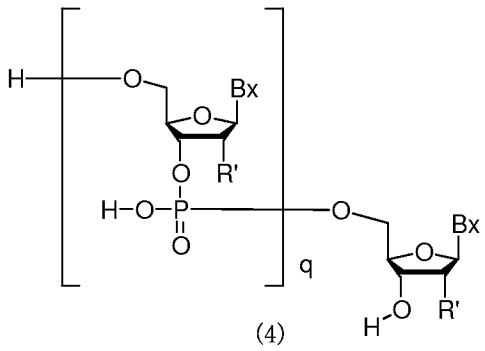
[Claim 8] The method for producing a ribonucleic acid compound according to any one of claims 4 to 7, wherein the levulinylating agent is levulinic acid, levulinic anhydride, a levulinate ester or a halide levulinate.

[Claim 9] The method for producing a ribonucleic acid compound according to any one of claims 5 to 8, wherein the phosphorylating reagent is 2-chlorophenyl phosphoroditriazolide, 2-chlorophenyl-O,O-bis(1-benzotriazolyl)phosphate or 2-chloro-4-tert-butylphenyl phosphoroditriazolide.

[Claim 10] The method for producing a ribonucleic acid compound according to any one of claims 6 to 9, wherein the reagent for protecting a phosphate group is 3-hydroxypropionitril or 2,2,2-trichloroethanol.

[Claim 11] A liquid-phase synthesis method for an oligonucleotide compound represented by the following general formula (4):

[Chemical Formula 23]



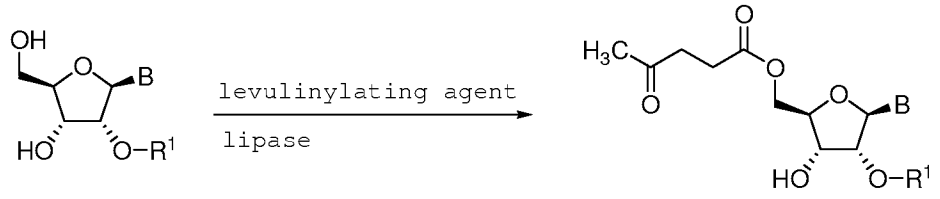
(4)

(wherein each Bx independently represents adenine, guanine, cytosine, uracil or thymine or a modified form thereof; q represents an integer in the range from 1 to 100; at least one of R' is hydroxyl and the others represent independently H or hydroxyl), comprising the following steps (a) to (f):

(a) producing a ribonucleic acid compound represented by the following general formula (3) by regioselectively levulinylating the hydroxyl at the 5'-position by allowing a levulinylating agent and a lipase to act on a ribonucleic acid compound represented by the

following general formula (2):

[Chemical Formula 24]

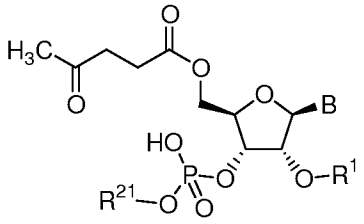


(2) (3)

(wherein B represents adenine, guanine, cytosine or uracil or a modified form thereof; and R^1 represents a protecting group which can be removed at 90% or more at a temperature in the range from 0°C to 60°C under acidic conditions at a pH value from 2 to 4 within 24 hours);

(b) producing a ribonucleic acid compound represented by the following general formula (1a) by phosphorylating the hydroxyl at the 3'-position by allowing a phosphorylating reagent to act on a ribonucleic acid compound (3) produced by the step (a):

[Chemical Formula 25]

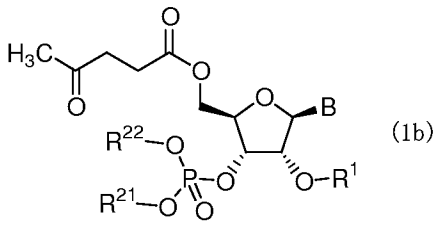


(1a)

(wherein B and R^1 are the same as defined above; and R^{21} represents aryl which may be substituted or a monocyclic or bicyclic heterocyclic group which may be substituted);

(c) producing, separately from the step (b), a ribonucleic acid compound represented by the following general formula (1b) by allowing a phosphorylating reagent and a reagent for protecting a phosphate group to act on a ribonucleic acid compound (3) produced by the step (a):

[Chemical Formula 26]

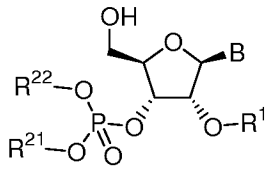


(1b)

(wherein B, R^1 and R^{21} are the same as defined above; and R^{22} represents alkyl which may be substituted);

(d) producing a ribonucleic acid compound represented by the following general formula (5) by deprotecting levulinyl of the ribonucleic acid compound (1b) produced by the step (c):

[Chemical Formula 27]



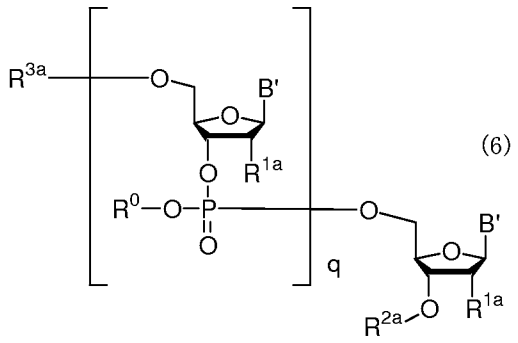
(5)

(wherein B, R^1, R^{21} and R^{22} are the same as defined above);

(e) producing an oligonucleotide compound represented by the following general formula (6) by stepwise oligomerization using as a monomer component, at least one of the ribonucleic acid compounds (1a) and (5)

produced by the steps (b) and (d), respectively:

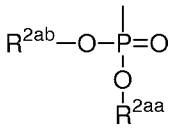
[Chemical Formula 28]



(6)

(wherein each B' independently represents adenine, guanine, cytosine, uracil or thymine or a modified form thereof; each R^0 independently represents H, aryl which may be substituted or a monocyclic or bicyclic heterocyclic group which may be substituted; R^{3a} represents H, levulinyl or 4,4'-dimethoxytrityl; q is the same as defined above; at least one of R^{1a} is hydroxyl substituted with a protecting group which can be removed at 90% or more at a temperature in the range from 0°C to 60°C under acidic conditions at a pH value from 2 to 4 within 24 hours, and the others independently represent H or hydroxyl substituted with a protecting group which can be removed at 90% or more at a temperature in the range from 0°C to 60°C under acidic conditions at a pH value from 2 to 4 within 24 hours; and R^{2a} represents acyl or a phosphate group represented by the following general formula (7):

[Chemical Formula 29]



(7)

(wherein R^{2aa} represents aryl which may be substituted or a monocyclic or bicyclic heterocyclic group which may be substituted; and R^{2ab} represents H or alkyl which may be substituted); and

(f) deprotecting all the protecting groups of the oligonucleotide compound (6) produced by the step (e).

[Claim 12] The liquid-phase synthesis method for an oligonucleotide compound according to claim 11, wherein R^1 is 2-tetrahydrofuranyl or 1,3-dioxolan-2-yl.

[Claim 13] The liquid-phase synthesis method for an oligonucleotide compound according to claim 11 or 12, wherein q is an integer in the range from 1 to 100.

[Claim 14] The liquid-phase synthesis method for an oligonucleotide compound according to any one of claims 11 to 13, wherein q is an integer in the range from 10 to 50.

[Claim 15] The liquid-phase synthesis method for an oligonucleotide compound according to any one of claims 11 to 14, wherein the levulinylating agent is levulinic acid, levulinic anhydride, a levulinate ester or a halide levulinate.

[Claim 16] The liquid-phase synthesis method for an oligonucleotide compound according to any one of claims 11 to 15, wherein the phosphorylating reagent is 2-

chlorophenyl phosphoroditriazolide, 2-chlorophenyl-O,O-bis(1-benzotriazolyl)phosphate or 2-chloro-4-tert-butylphenyl phosphoroditriazolide.

[Claim 17] The liquid-phase synthesis method for an oligonucleotide compound according to any one of claims 11 to 16, wherein the reagent for protecting a phosphate group is 3-hydroxypropionitril or 2,2,2-trichloroethanol.